2.0 STUDY AREA DESCRIPTION

The Study Area includes an approximately 19 kilometer section of the Housatonic River in Pittsfield, Lenox, and Lee, Berkshire County, Massachusetts (Figure 1.1) from the Newell Street Bridge, in Pittsfield, to the Woods Pond in Lenox/Lee. In addition to the river, the Study Area includes the upland and wetland communities adjacent to the river and within the ten-year floodplain.

2.1 Regional Description

The Study Area is located in central Berkshire County, Massachusetts. Berkshire County is on the western edge of the state and is bordered by Connecticut (south), New York (west), and Vermont (north). This part of Massachusetts contains the most topographical relief, as well as the highest point in the state (Mount Greylock - 1064 meters). Though sometimes referred to by different names, Berkshire County is usually divided into three sections: (1) the Berkshire Plateau; (2) the Taconic Range; and (3) the Central Valley region (New England River Basins Commission 1980, Veit and Petersen 1993, Weatherbee 1996). The Berkshire Plateau, a southern extension of Vermont's Green Mountains, forms a ridge that runs along the eastern edge of the county. The Taconic Range, extending from Vermont to New York, forms the western edge of the county. The Central Valley region lies between these two mountain ranges, and is where the Study Area is located.

2.2 Historical Land Use

Native American people were present in Berkshire County prior to European settlement. As recent as 1735, the Mahicans were using the alluvial plains of the Housatonic River for hunting and agriculture (Weatherbee 1996). Because cutting trees was primarily for heating purposes, and crops (such as corn, beans, and squash) were primarily planted in abandoned beaver impoundments, it is believed the impact of the Native Americans on the natural communities was minimal (Weatherbee 1996).

After European settlement, land clearing in Berkshire County progressed rapidly (Dwight 1822, Brooks 1953). In some parts of the county, as much as seventy-seven percent of the forests had been cleared for agriculture by 1800 (Brooks 1953), and wood shortages were reported from the region (Federal Writer's Project 1938). In addition to clearing of land for crop space, local industries began to affect the surrounding forests in the 19th century. Sawmills, tanneries, railroads and their engines, iron furnaces, and lime kilns all required trees for everyday operation (Weatherbee 1996). In 1867, the first paper mill in the area was established in Lee. Local timber supplies were eventually exhausted and raw materials were transported from increasingly more distant sources (Federal Writer's Project 1938).

By the end of the 19th century, two factors caused a reduction in the use of the forest products in the area. The first factor was the development of midwestern farms and the creation of the Erie Canal, which allowed farm products to be transported to the east. The second factor was the exhaustion of marketable timber from the surrounding forests (Fisher 1933). Farm abandonment and subsequent reforestation, both through natural processes and plantings, began to shape the landscape of Berkshire County in the early part of the 20th century.

PCBs have come to be located by hydraulic transport in the sediments of the Housatonic River and adjacent floodplain soils downstream of the GE facility in Pittsfield. Based upon previous investigation, it was estimated that the amount of sediment containing PCB concentrations greater than 1 part per million (ppm) between the GE facility and Woods Pond is 600,636 cubic meters (Blasland, Bouck, and Lee, Inc. 1996a). For the same section of river, the estimated volume of sediments containing PCB concentrations higher than 10 ppm and 50 ppm was 374,919 cubic meters and 198,171 cubic meters, respectively (Blasland, Bouck, and Lee, Inc. 1996a). Use of cesium-137 for geochronological dating indicated that peak PCB levels and transport occurred in the early 1960's (Blasland, Bouck, and Lee, Inc. 1996). Additional investigations underway by USEPA may further refine these estimates.

2.3 Climate

Berkshire County is considered to have a continental climate, similar to the rest of interior New England, characterized by cold winters and hot summers (United States Department of

Agriculture 1988). Average annual temperature, average daily July temperature, and average daily January temperature for Lanesboro, immediately north of Pittsfield, have been 6°, 19 °, and -8° Celsius, respectively, and the number of frost free days (growing season) ranges from 103 to 144 days (Weatherbee 1996). Moisture supply usually exceeds evaporation, except during periods of drought. Average total rainfall is 109 cm and is evenly distributed throughout the year. Average total snowfall is 181 cm (Weatherbee 1996).

2.4 Water Resources

The water resources for the Study Area include riverine, lacustrine, and palustrine wetlands.

2.4.1 Regional Description

Berkshire County possesses seven major river systems that drain into three watersheds. The Hoosic River, along with Bash Bish and Kinderhook Brooks, drain into the Hudson River. The Deerfield and Westfield Rivers empty into the Connecticut. The Housatonic River, which eventually collects waters from the Farmington River, flows into Long Island Sound. Approximately 197 lakes are located in Berkshire County (McCann and Daly undated). Forty-five percent of these are artificial ponds and reservoirs. A number of the remaining water bodies have been altered or enlarged in some fashion, usually for recreation or water power purposes.

Because of the varied topography of Berkshire County, there are an abundance of ponds, bogs, and marshes. An estimated three percent of the county is considered to be occupied by palustrine communities (*i.e.*, wetlands) (Technical Planning Associates 1959). The Housatonic River basin is noted to contain the majority of wetlands in the county.

2.4.2 Study Area Description

The Study Area includes the Housatonic River, East Branch Housatonic River, Woods Pond, and the portion of Yokum Brook and Willow Creek occurring in the ten-year floodplain of the

Housatonic River. Several small brooks, which drain from the west side of the October Mountain range, enter the Housatonic River south of the New Lenox Road. South of the New Lenox Road, the Study Area is primarily bounded by the Springfield Terminal railroad line on the west, except where the ten-year floodplain extends further west (Yokum Brook and Willow Creek), and on the east by the abrupt topographic rise associated with the October Mountain range.

2.4.2.1 Streams, Lakes, and Ponds

The Housatonic River is the major water feature in the Study Area. It is formed by the confluence of the East and West Branch in Pittsfield. The East Branch begins in Dalton and Hinsdale, fed by headwater tributaries. The West Branch starts at Onota and Pontoosuc Lakes in Pittsfield and Lanesboro and is augmented by flows from the Southwest Branch. The Housatonic River ranges in elevation in the Study Area from 296 meters above mean sea level (msl) near the Newell Street Bridge to 292 meters above msl at the Woods Pond Dam. This equates to an approximate 20 cm drop per kilometer of river. Most of this elevation loss occurs in the upstream section of the Study Area, particularly between Elm Street and Dawes Avenue in Pittsfield. Average flow rates are 2.9 cubic meters per second (cms) in the upstream portion (Newell Street to Pomeroy Avenue), 4.0 cms in the middle portion (Pomeroy Avenue to New Lenox Road), and 6.3 cms in the downstream portion (New Lenox Road to Woods Pond) (Canonie Environmental 1995). Based on measurements collected from late May to late September 1993, temperature in the Housatonic River ranged from 11° to 32° Celsius, dissolved oxygen ranged from 6.2 to 9.4 mg/L, and pH ranged from 7.9 to 8.3 (Canonie Environmental 1995). The width of the Housatonic River ranges from approximately 12 to 36 meters, being widest near Woods Pond as a result of impoundment.

Woods Pond is an approximately 20 hectare impoundment created in 1890. Most of the pond is less than 2 meters deep, with the maximum depth at 4.8 meters. In 1989, a new dam for Woods Pond was constructed approximately 55 meters downstream of the historic dam (Canonie Environmental 1995). Based on measurements collected from late May to late September 1993, temperature in Woods Pond ranged from 12° to 33° Celsius and dissolved oxygen ranged from 3.2 to 11.2 mg/L (Chadwick and Associates 1994).

Yokum Brook originates in the Pleasant Valley, on the east side of Lenox Mountain, in Lenox. Its east and west branches have numerous small ponds and wetland areas along its course. Just before entering the Housatonic River, south of the New Lenox Road and west of the Springfield Terminal railroad line, Yokum Brook expands into a large wetland system that is within the ten-year floodplain of the Study Area. This wetland system includes low-gradient stream, robust emergent marsh, circumneutral shrub swamp, and circumneutral hardwood swamp communities.

Willow Creek is a small stream, approximately 4.2 km long, that originates between two ridges just north of Lenox Village. While most of the stream is narrow and quick-flowing, in its final kilometer, before the confluence with the Housatonic River, Willow Creek slows and broadens into an expansive wetland system of robust emergent marshes and circumneutral shrub swamps.

2.4.2.2 Water Quality

The quality of the water resources in the Study Area is affected by industrial and municipal discharges. Discharges contribute significant flow quantities to the Housatonic River. Municipal treatment plants located in Massachusetts add 0.6 cms of wastewater flow to the river. Industrial plants provide an additional 0.7 cms (Frink *et al.* 1982). The Pittsfield wastewater treatment plant, which discharges its effluent near the midpoint of the Study Area, contributes an average flow of 0.5 cms to the Housatonic River (Harrington Engineering and Construction, Inc. 1996). These represent approximately 20, 24, and 17 percent of the flow of the river at the point of discharge, respectively.

The water quality within the Study Area has also been affected by other factors. Additional hazardous constituents (*e.g.*,PCBs, polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, inorganics) have been detected in the sediments and floodplain soils of the Housatonic River (Blasland, Bouck, and Lee, Inc. 1996a). Nitrate levels of 0.33 to 2.40 mg/L in the river water also indicate that some nutrient loading is occurring (Chadwick and Associates, Inc. 1994).

2.5 Soils and Geological Resources

The bedrock geology of Berkshire County is considered diverse and complex. Geologic forces have caused several different soil types to occur in close proximity to each other. In addition, Berkshire County contains the largest marble deposits in the state. The combination of diverse soil types and circumneutral substrate are thought to be important in explaining the rare species diversity of the Housatonic River (Weatherbee 1996).

2.5.1 Soils

Six major soil associations are present in the Housatonic River basin (New England River Basins Commission 1980). Three of the associations, Paxton-Woodbridge, Charlton-Hollis, and Lyman-Peru-Marlow-Berkshire, are derived from glacial till and schist. These soils are characterized by shallow depth to bedrock, hardpan, stoniness, or steep slope. Two of the soil associations are derived from limestone and schist. These are called Copake-Groton, found in the Central Valley region, and Stockbridge-Farmington-Amenia-Pittsfield, located in the Taconic Range. They are characterized by deep, well drained soils. The final soil association is called the Hinckley-Merrimac. This association is located along the valley edges on glacial outwash terraces. It is characterized by deep, sandy, well-drained, acidic soils.

Much of the Study Area is located within the Copake-Hero-Hoosic soil complex. These are deep, well drained, nearly level to moderately steep, loamy soils formed by glacial outwash (United States Department of Agriculture 1988). This soil complex is comparable to the Copake-Groton soil association. The soils of the Study Area are further subdivided into soil series. At least 17 soil series are represented within the project boundary. The most common soil series are sandy loams, silt loams, and mucks (United States Department of Agriculture 1988).

Soils in the floodplain and adjacent areas are derived either directly from bedrock, from calcareous glacial till or silicate alluvium deposited in the floodplain, or from organic mucks that formed in areas removed from the effects of flooding. Overwash of silt and fine sand into the

floodplain is apparent in much of the low floodplain. Heavier soil particles, such as medium to coarse sands, remain within the channel and are the dominant soils of the river banks and bars.

2.5.2 Geology

The bedrock of the Housatonic River basin is primarily metamorphic rock (gneiss, schist, limestone, and dolomite) (Blasland, Bouck, and Lee, Inc. 1996a). Within the Study Area, calcareous rock (limestone, dolomite) is the dominant bedrock type. Because this type of rock is relatively soluble, the groundwater in these areas is typically mineralized.

The calcareous bedrock of the Housatonic River basin increases the pH of the groundwater. With the Housatonic River identified as the ultimate receptor of groundwater discharges in the Study Area (Blasland, Bouck, and Lee, Inc. 1996a), the riparian habitats are enriched with circumneutral water. Circumneutral water facilitates the uptake of nutrients and the decomposition of organic material (Weatherbee 1996). Nitrogen and phosphorus, often considered limiting nutrients for plants in freshwater wetlands, are at or near there highest availability in waters with pH measurements of the Housatonic River (Foth 1951), and therefore may not be limited in this system. The composition of the bedrock, in part, explains the relative richness of the riparian communities.

2.6 Natural Communities

Eight natural communities occur within the Study Area. Three are upland communities, four are palustrine communities, and one is a riverine community (included in section 2.6.2). Though organic soils do occur in the Study Area (primarily as inclusions within larger communities), all the communities are considered to be mineral soil systems.

2.6.1 Uplands

Floodplain Forest Community

These floodplain forested areas are adjacent to the river channel and are periodically inundated during flood stage. Consequently, the soils frequently possess thick accumulations of alluvial silt. The hydrology and plant species composition associated with this community varies greatly from site to site. One of the species associations (silver maple-false nettle-sensitive fern) is described in depth in section 3.6 under exemplary natural communities because of its special significance in Massachusetts. The remainder of the floodplain forests in the Study Area are dominated by a mixture of box-elder (*Acer negundo*), silver maple (*Acer saccharinum*), and black willow (*Salix nigra*). Silky dogwood (*Cornus amomum*) and arrowwood (*Viburnum dentatum*) are common shrubs. White snakeroot (*Argeratina altissima*), wood-nettle (*Laportea canadensis*), ostrich fern (*Matteuccia struthiopteris*), and zig-zag goldenrod (*Solidago flexicaulis*) are generally present to some degree in each floodplain forest, however, the herb layer is often strikingly different from site to site.

Mesic Acidic Oak-Conifer Forest Community

These mesic to wet-mesic forests contain a mixture of broad-leaf and needle-leaf trees in the canopy. Eastern white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*) are the common needle-leaf trees, while red maple (*Acer rubrum*), red oak (*Quercus rubra*), and black cherry (*Prunus serotina*) are the common broad-leaf trees. Common shrubs included witch hazel (*Hamamelis virginiana*) and choke cherry (*Prunus virginiana*). The herb layer varies with hydrology. On drier sites white snakeroot, hay-scented fern (*Dennstaedia punctilobula*), stiff clubmoss (*Lycopodium annotinum*), and prickly tree clubmoss (*Lycopodium dendroideum*) are dominant. Relatively wetter sites are vegetated by lady fern (*Athyrium felix-femina*), long-awned woodgrass (*Brachyelytrum septentrionale*), sensitive fern (*Onoclea sensibilis*), and cinnamon fern (*Osmunda cinnamomea*).